TRITIUM IN THE ENVIRONMENT AND ITS IMPACT ASSESSMENT AGAINST THE EXISTING RADIATION PROTECTION FRAMEWORK REVISITED

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With the development of nuclear power programme, an additional consideration outside the existing radiation protection framework has appeared: the need to assess not only the level of exposure, but also to take into consideration the accidents which could release large inventories of radioactivity. Naturally, tritium is produced in the upper atmosphere by the interaction of cosmic rays with nitrogen and hydrogen. The tritons in the upper atmosphere are oxidized to tritiated water (HTO) and mix with the hydrosphere generally through the movement of air masses and precipitation. Terrestrially, tritium may be formed by the action of lithium on neutrons. As per the new technological advancements the possible use of tritium as the fuel for fusion reactors may result in its additional source. Tritium has appeared as an occupational hazard mainly as tritiated water of high specific activity or as tritium gas. Tritium constitutes a unique toxicity because even its small amount introduced as tritiated water (HTO) will find its way through metabolic pathways into the newly synthesized DNA. There is apprehension that the health and environmental impact of tritium may end up as worldwide contaminants in the final analysis. Swiss albino mice of 1, 2, 3, 4 & 6 weeks of age were injected with tritiated water (HTO) at the dose 111 kBq/gram body weight and the animals from each age group autopsied on 1,7 and 30 days post- injection & hence, qualitatively and quantitatively studied for cerebellar vulnerability. In cerebellum, major cytoarchitectural changes occur mainly during the first three weeks after birth. This accounts for its higher radiovulnerability and a capability to repair and recover from the rendered damage during the first half (1 week to 3 week) of postnatal development, whereas during the second half (4 week to 6 week of age) a tendency towards radioresistance is achieved. These results arouse concern over the behaviour and health implications of environmental tritium which is further evidenced by a rapid increase in publications on the issue. The current controversy will be intensified in future as the fusion reactor technology approaches the door step of public and the possible health detriment from its radioactive emissions arouse specific interest. The presentation is an attempt to revisit the work on the behaviour of tritium in its different forms in the environment with an emphasis on the release from various sources, its world inventories at present levels and its transfer in the various compartments of ecosystems. Besides, its metabolism in biosystem and the possible implications of low doses of tritium in present and future generations will also be discussed in accordance with the presently projected radiation protection framework.